

Case Study



Treatment of Invasive Skull Base Maxillary Sinus Squamous Cell Carcinoma

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| Institution: | University of Pittsburgh Medical Center, Pittsburgh, PA |
| Neurosurgeon: | L. Dade Lunsford, MD |
| Medical Physicist: | Josef Novotny, PhD |
| Radiation Oncologist: | John C. Flickinger, MD |
| Patient: | 67-year-old male |
| Diagnosis: | Maxillary sinus squamous cell carcinoma |
| Treatment: | Three Gamma Knife® radiosurgery treatments 1 - 7 isocenters, margin dose of 13Gy at 50% (cavernous sinus segment) 2 - 11 isocenters, margin dose of 14Gy at 50% (petrous bone segment) 3 - 18 isocenters with 4 composite isocenters, margin dose of 10Gy at 50% (maxillary sinus segment) |

Gamma Knife® surgery, sometimes referred to as stereotactic radiosurgery, is a non-invasive method for treating brain disorders. It is the delivery of a single, high dose of irradiation to small and critically located intracranial volumes through the intact skull. Gamma Knife surgery is preferred for its accuracy, efficiency and therapeutic response. There are currently more than 250 Gamma Knife centers worldwide and approximately 500,000 patients have undergone Gamma Knife surgery. Now with the introduction of Leksell Gamma Knife® Perfexion™, new levels of performance and efficiency are brought to the field of stereotactic radiosurgery.

Treatment of Invasive Skull Base Carcinoma with Leksell Gamma Knife® Perfexion™

FACT:

UPMC Presbyterian is the only center in North America to have three fully functional Gamma Knife units, which have treated over 8,500 patients.

"This patient had already failed surgery and IMRT. Two Gamma Knife surgeries have proven effective for controlling the disease. This provided a good indication of the possibility of using Perfexion for the resurgent extracranial skull base and maxillary sinus disease for which no other treatment option was possible."

Dr. L. Dade Lunsford
Director, UPMC
Presbyterian Hospital

Patient diagnosis and history

This 67-year-old male presented with an invasive squamous cell carcinoma, originally of the sphenoid sinus, that progressed into the maxillary sinus after prior fractionated radiotherapy. This patient was originally diagnosed with poorly differentiated squamous cell carcinoma of the left sphenoid sinus in 2003. After surgery following chemotherapy, this patient underwent external beam radiation therapy to a dose of 70.2Gy in November 2003. The tumor recurred in the left cavernous sinus and petrous bone and was associated with decreased hearing, left facial weakness and left facial numbness. In April 2006 the patient underwent stereotactic radiosurgery using Leksell Gamma Knife 4C to the left cavernous sinus, petrous bone and tumor in the cerebello-pontine angle to 13Gy with a treatment volume of 4.8 cc. The tumor progressed again and this patient underwent further treatment to a new area of tumor progression in August 2007 with a dose of 14Gy to a 3.3 cc 50% isodose treatment. The areas treated by radiosurgery have regressed, however, the tumor progressed in the left maxillary sinus and extended to the floor of the orbit. The patient developed mild proptosis of the left eye.

Treatment

Dr. Lunsford, Director of the Center for Image Guided Neurosurgery at UPMC Presbyterian Hospital, met with the patient and explained the treatment options, now suitable for extracranial radiosurgery using Perfexion technology.

The procedure used 18 isocenters with 4 composite isocenters. The prescription dose was 10Gy at 45 % isodose. The radiosurgery target volume was 64.9 cc. Dynamic shaping was used to determine sector patterns to minimize dose to the optic pathways (the maximum dose was 3.9Gy).

Even with the composite shots and sector blocking, the beam-time for the entire treatment was under 60 minutes.

Conclusion

This patient had a very large tumor and history of progression despite high dose radiotherapy and chemotherapy. Gamma Knife surgery has been effective for the petrous and cavernous sinus tumors. Gamma Knife Perfexion also allowed treatment of the recurrent maxillary sinus cancer.



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